

### SEM Supports CMM-SW Level 3

Mapping of the DOE Information Systems Engineering Methodology to the Software Engineering Institute (SEI) Software Capability Maturity Model (CMM-SW) level 3.

KPA Number	KPA Activity	SEM Section	SEM Work Product	SQSE Web site <a href="http://cio.doe.gov/sqse">http://cio.doe.gov/sqse</a>
<b>ORGANIZATION PROCESS FOCUS</b>				
OPF-1	The software process is assessed periodically, and action plans are developed to address the assessment findings.	Chapter 1 • Organizational Process Management	• Process Improvement Action Plan	• Methodologies → DOE Methodologies → SEM
OPF-2	The organization develops and maintains a plan for its software process development and improvement activities.	Chapter 1 • Organizational Process Management	• Process Improvement Action Plan	• Methodologies → DOE Methodologies → SEM
OPF-3	The organization's and projects' activities for developing and improving their software processes are coordinated at the organization level.	Chapter 1 • Organizational Implementation of Methodology • Project Implementation of Methodology	• Defined at the Task Level • Project Plan	• Methodologies → DOE Methodologies → SEM • Project Management
OPF-4	The use of the organization's software process database is coordinated at the organizational level.	Chapter 1 • Organizational Process Management	• Organizational Process Database • Organizational Library	• Methodologies → DOE Methodologies → SEM
OPF-5	New processes, methods, and tools in limited use in the organization are monitored, evaluated, and, where appropriate, transferred to other parts of the organization.	Chapter 1 • Organizational Process Management	• Organizational Process Database • Organizational Library	• Methodologies → DOE Methodologies → SEM
OPF-6	Training for the organization's and projects' software process is coordinated across the organization.	Chapter 1 • Organizational Training	• Training Policy • Training Plan	• Methodologies → DOE Methodologies → SEM • Training

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<b>ORGANIZATION PROCESS FOCUS</b>				
OPF-7	The groups involved in implementing the software processes are informed of the organization's and projects' activities for software process development and improvement.	Chapter 1 <ul style="list-style-type: none"><li>Organizational Process Management</li></ul>	<ul style="list-style-type: none"><li>Process Development and Improvement Plan</li></ul>	<ul style="list-style-type: none"><li>Methodologies → DOE Methodologies → SEM</li></ul>

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<b>ORGANIZATION PROCESS DEFINITION</b>				
OPD-1	The organization's standard software process is developed and maintained according to a documented procedure.	Chapter 1 <ul style="list-style-type: none"> <li>Introduction</li> <li>Organizational Process Management</li> </ul>	<ul style="list-style-type: none"> <li>Revised SEM</li> <li>Organization-Specific Process</li> </ul>	Methodologies → DOE Methodologies → SEM
OPD-2	The organization's standard software process is documented according to established organization standards.	Chapter 1 <ul style="list-style-type: none"> <li>Introduction</li> <li>Relationship to Other Programs</li> </ul>	<ul style="list-style-type: none"> <li>Revised SEM</li> <li>Organization-Specific Process</li> </ul>	Methodologies → DOE Methodologies → SEM
OPD-3	Descriptions of software life cycles that are approved for use by the projects are documented and maintained.	Chapter 2 <ul style="list-style-type: none"> <li>Lifecycle Model</li> <li>Adapting the Lifecycle</li> <li>Development Techniques</li> </ul>	<ul style="list-style-type: none"> <li>Project's Lifecycle Model</li> </ul>	Methodologies → DOE Methodologies → SEM
OPD-4	Guidelines and criteria for the projects' tailoring of the organization's standard software process are developed and maintained.	Chapter 2 <ul style="list-style-type: none"> <li>Adapting the Lifecycle</li> <li>COTS Products Based Projects</li> </ul>	<ul style="list-style-type: none"> <li>Project's Lifecycle Model</li> <li>Project Plan</li> </ul>	Methodologies → DOE Methodologies → SEM
OPD-5	The organization's software process database is established and maintained.	Chapter 1 <ul style="list-style-type: none"> <li>Organizational Process Management</li> </ul>	<ul style="list-style-type: none"> <li>Organizational Process Database</li> </ul>	Methodologies → DOE Methodologies → SEM
OPD-6	A library of software process related documentation is established and maintained.	Chapter 1 <ul style="list-style-type: none"> <li>Organizational Process Management</li> </ul>	<ul style="list-style-type: none"> <li>Organizational Library</li> </ul>	Methodologies → DOE Methodologies → SEM

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<b>TRAINING PROGRAM</b>				
TP-1	Each software project develops and maintains a training plan that specifies its training needs.	Chapter 1 • Organizational Training Chapter 3 • Develop Project Plan	• Organizational Training Plan • Project Plan	• Training • Project Mgmt. → Document Samples • Templates/Checklists
TP-2	The organization's training plan is developed and revised according to a documented procedure.	Chapter 1 • Organizational Training	• Organizational Training Policy • Organizational Training Plan	• Training • Project Mgmt. → Document Samples • Templates
TP-3	The training for the organization is performed in accordance with the organization's training plan.	Chapter 1 • Organizational Training	• Completed Training Records	• Training • Templates/Checklists
TP-4	Training courses prepared at the organization level are developed and maintained according to organization standards.	Chapter 1 • Organizational Training	• Documented Standard	• Training • Templates
TP-5	A waiver procedure for required training is established and used to determine whether individuals already possess the knowledge and skills required to perform in their designated roles.	Chapter 1 • Organizational Training	• Completed Waiver	• Training
TP-6	Records of training are maintained.	Chapter 1 • Organizational Training	• Completed Training Records	• Training • Checklists

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<b>INTEGRATED SOFTWARE MANAGEMENT</b>				
ISM-1	The project's defined software process is developed by tailoring the organization's standard software process according to a documented procedure.	Chapter 1 <ul style="list-style-type: none"> <li>Project Implementation of Methodology</li> </ul> Chapter 2 <ul style="list-style-type: none"> <li>Adapting the Lifecycle</li> <li>COTS Products Based Projects</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Project WBS</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Project Management</li> </ul>
ISM-2	Each project's defined software process is revised according to a documented procedure.	Chapters 4,5,6,7,8,9 <ul style="list-style-type: none"> <li>Revise Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Revised Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Project Management</li> </ul>
ISM-3	The project's software development plan, which describes the use of the project's defined software process, is developed and revised according to a documented procedure.	Chapter 3 <ul style="list-style-type: none"> <li>Develop Project Plan</li> </ul> Chapters 4,5,6,7,8,9 <ul style="list-style-type: none"> <li>Revise Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Revised Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Project Management</li> </ul>
ISM-4	The software project is managed in accordance with the project's defined software process.	Chapter 3 <ul style="list-style-type: none"> <li>Project Management</li> <li>Project Tracking and Oversight</li> </ul>	<ul style="list-style-type: none"> <li>Measurements</li> <li>Corrective Actions</li> <li>Accomplishments</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Project Management</li> </ul>
ISM-5	The organization's software process database is used for software planning and estimating.	Chapter 3 <ul style="list-style-type: none"> <li>Develop the Project Estimate</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Project WBS</li> <li>Project Schedule</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Project Management</li> </ul>

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<b>INTEGRATED SOFTWARE MANAGEMENT</b>				
ISM-6	The size of the software work products (or size of changes to the software work products) is managed according to a documented procedure.	Chapter 3 <ul style="list-style-type: none"> <li>Develop Software Configuration Management (SCM) Plan</li> </ul> Chapter 4 <ul style="list-style-type: none"> <li>Requirements Change Control</li> </ul>	<ul style="list-style-type: none"> <li>SCM Plan</li> <li>Software Change Request Form</li> <li>Software Change Control Log</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Project Management</li> <li>Templates</li> <li>Checklists</li> </ul>
ISM-7	The project's software effort and costs are managed according to a documented procedure.	Chapter 3 <ul style="list-style-type: none"> <li>Project Management</li> <li>Project Tracking and Oversight</li> </ul> All Project Stages <ul style="list-style-type: none"> <li>Conduct Stage Exit</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Revised Project Plan</li> <li>Stage Exit Process Inputs and Outputs</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Stage Exit Guide</li> </ul>
ISM-8	The project's critical computer resources are managed according to a documented procedure.	Chapter 3 <ul style="list-style-type: none"> <li>Project Management</li> <li>Project Tracking and Oversight</li> </ul> All Project Stages <ul style="list-style-type: none"> <li>Conduct Stage Exit</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Revised Project Plan</li> <li>Stage Exit Process Inputs and Outputs</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Stage Exit Guide</li> </ul>
ISM-9	The critical dependencies and critical paths of the project's software schedule are managed according to a documented procedure.	Chapter 3 <ul style="list-style-type: none"> <li>Project Management</li> <li>Project Tracking and Oversight</li> </ul> All Project Stages <ul style="list-style-type: none"> <li>Conduct Stage Exit</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Revised Project Plan</li> <li>Stage Exit Process Inputs and Outputs</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Stage Exit Guide</li> </ul>
ISM-10	The project' software risks are identified, assessed, documented, and managed according to a documented procedure.	Chapter 3 <ul style="list-style-type: none"> <li>Project Management</li> <li>Project Tracking and Oversight</li> </ul> All Project Stages <ul style="list-style-type: none"> <li>Conduct Stage Exit</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan</li> <li>Revised Project Plan</li> <li>Stage Exit Process Inputs and Outputs</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Stage Exit Guide</li> </ul>

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<b>INTEGRATED SOFTWARE MANAGEMENT</b>				
ISM-11	Reviews of the software project are periodically performed to determine the actions needed to bring the software project's performance and results in line with the current and projected needs of the business , customer, and end users, as appropriate.	Chapter 5 • Conduct Functional Design Review Chapter 6 • Conduct Critical Design Review All stages • Conduct Stage Exit	<ul style="list-style-type: none"> <li>• Functional Design Document</li> <li>• Critical Design Document</li> <li>• Stage Exit Inputs and Outputs</li> </ul>	<ul style="list-style-type: none"> <li>• Methodologies → DOE Methodologies → SEM</li> <li>• Stage Exit Guide</li> </ul>

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<b>SOFTWARE PRODUCT ENGINEERING</b>				
SPE-1	Appropriate software engineering methods and tools are integrated into the project's defined software process.	Chapter 2 <ul style="list-style-type: none"> <li>Adapting the Lifecycle</li> <li>Development Techniques</li> <li>COTS Products</li> <li>Quality Reviews</li> </ul>	<ul style="list-style-type: none"> <li>Project's Defined Process</li> <li>COTS Adaptation</li> <li>Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Project Management</li> <li>Templates</li> <li>Checklists</li> </ul>
SPE-2	The software requirements are developed, maintained, documented, and verified by systematically analyzing the allocated requirements according to the project's defined software process.	Chapter 3 <ul style="list-style-type: none"> <li>Develop High-Level requirements</li> </ul> Chapter 4 <ul style="list-style-type: none"> <li>Requirements Management</li> <li>Define Project Requirements</li> <li>Compile and Document Project Requirements</li> </ul>	<ul style="list-style-type: none"> <li>Statement of High-Level Requirements</li> <li>Software Requirements Specification</li> <li>Requirements Traceability Matrix</li> </ul>	<ul style="list-style-type: none"> <li>Project Management → Requirements</li> <li>Templates</li> <li>Checklists</li> </ul>
SPE-3	The software design is developed, maintained, documented, and verified, according to the project's defined software process, to accommodate the software requirements and to form the framework for coding.	Chapter 5 <ul style="list-style-type: none"> <li>Develop Functional Design</li> </ul> Chapter 6 <ul style="list-style-type: none"> <li>Develop System Design</li> </ul>	<ul style="list-style-type: none"> <li>Functional Design Document</li> <li>System Design Document</li> <li>Traceability Matrix</li> <li>Data Dictionary</li> </ul>	<ul style="list-style-type: none"> <li>Templates</li> <li>Checklists</li> <li>SW &amp; Systems Engineering</li> </ul>
SPE-4	The software code is developed, maintained, documented, and verified, according to the project's defined software process, to implement the software requirements and software design.	Chapter 7 <ul style="list-style-type: none"> <li>Establish Programming Environment</li> <li>Write Programs</li> <li>Generate Operating Documentation</li> </ul>	<ul style="list-style-type: none"> <li>Software Units and Modules</li> <li>Integrated Functional Units</li> <li>Operating Documentation</li> </ul>	<ul style="list-style-type: none"> <li>Templates</li> <li>Checklists</li> <li>SW &amp; Systems Engineering</li> </ul>



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<b>SOFTWARE PRODUCT ENGINEERING</b>				
SPE-5	Software testing is performed according to the project's defined software process.	Chapter 7 <ul style="list-style-type: none"> <li>Conduct Unit Testing</li> </ul>	<ul style="list-style-type: none"> <li>Unit Test Materials</li> </ul>	<ul style="list-style-type: none"> <li>Templates</li> <li>Checklists</li> </ul>
SPE-6	Integration testing of the software is planned and performed according to the project's defined software process.	Chapter 8 <ul style="list-style-type: none"> <li>Conduct Integration Testing</li> </ul>	<ul style="list-style-type: none"> <li>Integration Test Report</li> </ul>	<ul style="list-style-type: none"> <li>Templates</li> <li>Checklists</li> </ul>
SPE-7	System and acceptance testing of the software are planned and performed to demonstrate that the software satisfies its requirements.	Chapter 8 <ul style="list-style-type: none"> <li>Conduct System Testing</li> <li>Train Acceptance Test Team</li> </ul> Chapter 9 <ul style="list-style-type: none"> <li>Conduct Acceptance Test</li> </ul>	<ul style="list-style-type: none"> <li>System Test Report</li> <li>Completed Acceptance Checklist</li> <li>Acceptance Test Report</li> </ul>	<ul style="list-style-type: none"> <li>Project Mgmt. → Metrics</li> <li>Templates</li> <li>Checklists</li> </ul>
SPE-8	The documentation that will be used to operate and maintain the software is developed and maintained according to the project's defined software process.	Chapter 7 <ul style="list-style-type: none"> <li>Generate Operating Documentation</li> </ul> Chapter 9 <ul style="list-style-type: none"> <li>Conclude Acceptance Test</li> <li>Test Operating Documentation</li> </ul>	<ul style="list-style-type: none"> <li>Operating Documents</li> <li>Maintenance Plan</li> </ul>	<ul style="list-style-type: none"> <li>Project Management</li> </ul>
SPE-9	Data on defects identified in peer reviews and testing are collected and analyzed according to the project's defined software process.	Chapter 2 <ul style="list-style-type: none"> <li>Structured Walkthrough (SWT)</li> </ul>	<ul style="list-style-type: none"> <li>SWT Meeting Record</li> <li>SWT MGMT Summary Report</li> </ul>	<ul style="list-style-type: none"> <li>Process Guides → Quality Assurance Guides</li> </ul>

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<b>SOFTWARE PRODUCT ENGINEERING</b>				
SPE-10	Consistency is maintained across software work products, including the software plans, process descriptions, allocated requirements, software requirements, software design, code, test plans and test procedures.	Chapter 2 • Quality Reviews Chapter 3 • Develop Project Plan Chapter 4 • Develop Traceability Matrix	<ul style="list-style-type: none"> <li>• Project Plan</li> <li>• Traceability Matrix</li> <li>• SWT Meeting Record</li> <li>• SWT Mgmt Summary Report</li> <li>• Completed Checklists</li> </ul>	<ul style="list-style-type: none"> <li>• Process Guides → Quality Assurance Guides</li> <li>• Project Management</li> <li>• Templates</li> <li>• Checklists</li> </ul>

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<b>INTERGROUP COORDINATION</b>				
IC-1	The software engineering group and the other engineering groups participate with the customer and end users, as appropriate, to establish the system requirements.	Chapter 3 <ul style="list-style-type: none"> <li>Establish Communication With Functional Areas</li> </ul> Chapter 4 <ul style="list-style-type: none"> <li>Define Project Requirements</li> <li>Document project Reqs.</li> <li>Conduct Stage Exit</li> </ul>	<ul style="list-style-type: none"> <li>Requirements Specification</li> <li>Requirements Traceability Matrix</li> <li>Stage Exit products</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM</li> <li>Templates</li> <li>Checklists</li> </ul>
IC-2	Representatives of the project's software engineering group work with representatives of the other engineering groups to monitor and coordinate technical activities and resolve technical issues.	Chapter 2 <ul style="list-style-type: none"> <li>Quality Reviews - Stage Exits</li> </ul> Chapter 3 <ul style="list-style-type: none"> <li>Develop Project Plan</li> <li>Project Planning Questionnaire</li> </ul>	<ul style="list-style-type: none"> <li>Stage Exit Inputs and Outputs</li> <li>Project Plan - roles and responsibilities</li> <li>Completed Project Planning Quest.</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM → Stage Exit Process</li> <li>Templates</li> </ul>
IC-3	A documented plan is used to communicate inter-group commitments and to coordinate and track the work performed.	Chapter 3 <ul style="list-style-type: none"> <li>Develop Project Plan</li> <li>Develop WBS</li> </ul> All Project Stages <ul style="list-style-type: none"> <li>Revise project Plan</li> <li>Conduct Stage Exit</li> </ul>	<ul style="list-style-type: none"> <li>Project Plan &amp; Revised Project Plan</li> <li>WBS</li> <li>Stage Exit Report</li> </ul>	<ul style="list-style-type: none"> <li>Templates</li> <li>WBS Models</li> </ul>
IC-4	Critical dependencies between engineering groups are identified, negotiated, and tracked according to a documented procedure.	Chapter 2 <ul style="list-style-type: none"> <li>Quality Reviews - Stage Exits</li> </ul> Chapter 3 <ul style="list-style-type: none"> <li>Develop Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>In-Stage Assessment report</li> <li>Stage Exit Outputs</li> <li>Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>Methodologies → DOE Methodologies → SEM → ISA and Stage Exit Processes</li> <li>Templates</li> </ul>

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<b>INTERGROUP COORDINATION</b>				
IC-5	Work products produced as input to other engineering groups are reviewed by representatives of the receiving groups to ensure that the work products meet their needs.	Chapter 2 • Quality Reviews - Stage Exits Chapter 3 • Develop Project Plan	<ul style="list-style-type: none"> <li>• Stage Exit Inputs and outputs</li> <li>• Project Plan - roles and responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>• Methodologies → DOE Methodologies → SEM → Stage Exit Process</li> <li>• Templates</li> </ul>
IC-6	Intergroup issues not resolvable by the individual representatives of the project engineering groups are handled according to a documented procedure.	Chapter 2 • Quality Reviews - Stage Exits Chapter 3 • Develop Project Plan	<ul style="list-style-type: none"> <li>• Stage Exit Inputs and Outputs</li> <li>• Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Methodologies → DOE Methodologies → SEM → Stage Exit Process</li> <li>• Templates</li> </ul>
IC-7	Representatives of the project engineering groups conduct periodic technical reviews and interchanges.	Chapters 2,3,5,6 <ul style="list-style-type: none"> <li>• 2 - Quality Reviews</li> <li>• 3 - Conduct Feasibility Review</li> <li>• 5 - Conduct Functional Design Review</li> <li>• 6 - Conduct Critical Design review</li> </ul>	<ul style="list-style-type: none"> <li>• Quality Reviews Inputs and Outputs</li> <li>• Feasibility Study Document</li> <li>• Functional Design Document</li> <li>• System Design Document</li> </ul>	<ul style="list-style-type: none"> <li>• Process Guides → Quality Assurance Guides</li> <li>• Methodologies → DOE Methodologies → SEM</li> </ul>

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<b>PEER REVIEWS</b>				
PR-1	Peer reviews are planned, and the plans are documented.	Chapter 2 • Structured Walkthrough (SWT)	<ul style="list-style-type: none"> <li>• Project Plan</li> <li>• WBS</li> </ul>	<ul style="list-style-type: none"> <li>• Project Management → Project Planning</li> </ul>
PR-2	Peer reviews are performed according to a documented procedure.	Chapter 2 • Structured Walkthrough Each stage • Activities, Tasks, Sub-tasks • Activities and Work Products chart	<ul style="list-style-type: none"> <li>• Project Plan</li> <li>• Quality Assurance Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Process Guides → Quality Assurance Guides</li> </ul>
PR-3	Data on the conduct and results of the peer reviews are recorded.	Chapter 2 • Structured Walkthrough	<ul style="list-style-type: none"> <li>• SWT Meeting Record</li> <li>• SWT MGMT Summary Report</li> </ul>	<ul style="list-style-type: none"> <li>• Process Guides → Quality Assurance Guides</li> </ul>